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Is Downward Wage Flexibility the Primary Factor of Japan's Prolonged Deflation?

(Running title: *Downward wage flexibility and deflation*)

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Is Downward Wage Flexibility the Primary Factor of Japan's Prolonged Deflation?

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Abstract

By using both macro- and micro-level data, this paper investigates how wages and prices evolved during Japan's lost two decades. We find that downward nominal wage rigidity was present in Japan until the late 1990s but disappeared after 1998 as annual wages became downwardly flexible. Moreover, nominal wage flexibility may have contributed to relatively low unemployment rates in Japan. Although macro-level movements in nominal wages and prices seemed to be synchronized, such synchronicity was not observed at the industry level. Therefore, wage deflation does not seem to be a primary factor of Japan's prolonged deflation.

Key words: Deflation, Downward nominal wage rigidity, Japanese labor market, Japan's lost two decades, Unit labor cost

JEL classification codes: J60, J30

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I. Introduction

Most central banks are now targeting a positive inflation rate of a few percentage points. One of the reasons for not targeting a zero inflation rate is the downward rigidity of nominal wages, which could cause huge inefficiency in the resource allocation of the labor market (Akerlof *et al*. 1996). By creating an environment in which real wages can be adjusted, a positive inflation rate thereby serves as a "safety margin" against the risk of declining prices.

Bewley (1999) finds that the key reason for the reluctance to make nominal wage cuts is the belief that wage decreases in nominal terms damage worker morale, which is a key determinant of worker productivity (see also the related literature on behavioral economics such as Kahneman *et al*. 1986).[1] Many studies also report the scarcity of nominal wage cuts relative to nominal wage increases, including McLaughlin (1994), Lebow *et al*. (1995), Card and Hyslop (1997), Kahn (1997), and Altonji and Deveuex (1998), for the United States; Fehr and Goette (2005) for Switzerland; and Kuroda and Yamamoto (2003a,b) for Japan.[2]

Empirical evidence on nominal wage rigidity continues to be reported even after the global financial crisis in 2008. For example, Fabiani *et al*. (2010) report that the incidence of wage cuts has increased little despite the global crisis in the Euro area. Similarly, ECB (2012) suggests a lower responsiveness of wages to rising unemployment during economic downturns. Daly *et al*. (2012) also report that the proportion of US workers reporting a wage freeze at the end of 2011 was higher than at any other point in the past 30 years. Therefore, nominal wages seem to be rigidly downward in many countries.

Looking at aggregate data, however, Japan seems to be an exception. Until the mid-1990s, average nominal wages had been increasing in Japan. However, they started to drop in 1998 and until date, this declining trend continues. These observations suggest that Japan's typical response to negative shocks since the late 1990s has been to cut wages in nominal terms. This may imply that resource inefficiency owing to downward rigidity is no longer an issue in Japan. However, the alternative view suggests that wage flexibility may actually be a serious handicap since it makes it difficult for the economy to escape deflation (see, for example, De Grauwe 2009; Krugman 2012).[3] Yoshikawa (2013), for instance, points out that wage cuts are the major cause of keeping the Japanese economy trapped in prolonged deflation. Wage cuts trap companies in a negative spiral by lowering the prices of goods and services while protecting employment at the micro level. Since each firm adopts the same strategy, however, their individual competitiveness does not improve, which leads to further cuts in wages and prices and results in a deflationary trap. From this perspective, an economy that has greater wage flexibility must rather target a higher inflation rate to create a larger safety margin against such a deflationary trap. Does flexibility may give way to rigidity, as De Grauwe (2009) points out?

Based on Japan's recent experience, this paper examines how nominal wages evolved during the lost two decades in Japan. In particular, we aim to answer the following questions. Did nominal wages really decline during these two decades and did downward nominal wage rigidity disappear in Japan? If so, which groups were more likely to experience wage cuts? What was its effect on the unemployment rate? Further, are wage cuts or nominal wage flexibility the reason behind deflation?

The remainder of this paper is organized as follows. In Section II, we describe how nominal wages at both the macro and the micro level have fluctuated during the lost two decades, using aggregate and longitudinal data. In Section III, we assess how downward nominal wage rigidity or flexibility affected Japan's unemployment rate during this period. In Section IV, we investigate whether movements in wages and prices are synchronized by industry. Section V concludes.

II. Wage Fluctuation since the Bubble Burst

We start by examining how nominal wages and prices at the macro level evolved in the lost two decades in Japan. Figure 1 shows the year-on-year change in nominal wages (in terms of average wages per worker calculated from *SNA*), CPI inflation rate, GDP deflator, and unemployment rate. The figure illustrates that the annual change in nominal wages remained positive until 1997 but fell below 0 percent thereafter. Following the bursting of the bubble in Japan in the early 1990s, the Asian financial crisis of 1998 further dampened the economy. At this time, the Bank of Japan introduced a zero-interest rate policy to prevent the economy from falling into further recession. However, the recession deepened after 1998 until the early 2000s, with the unemployment rate rising to an unprecedented level of 5.4 percent during this period. A year after the downward adjustment of nominal wages in 1998, the CPI inflation rate also fell below zero in 1999. Since then, Japan has experienced mild but prolonged wage and price deflation.

The foregoing evidence suggests that wage cuts in nominal terms have been Japan's typical response to negative shocks since the late 1990s. For example, as shown in Figure 1, nominal wages dropped sharply when the global financial crisis in 2008 hit the world economy. One may think that the decline in nominal wage in Figure 1 was due to the rapid increase in non-regular workers who earn relatively low wages. Since the late 1990s, the ratio of non-regular workers to all workers has almost doubled. According to the *Labour Force Survey* (Statistics Bureau), the proportion of non-regular workers was 16.4 percent in 1985, but grew rapidly to 20.9 percent in 1995, 32.6 percent in 2005, and 34.3 percent in 2010. Because the average wage rate of a typical non-regular worker is much less than that of a regular worker,[4]

increasing the size of the non-regular workforce is an effective method of securing flexibility not only in employment but also in wages.[5]

To determine the degree to which the decline in nominal wages shown in Figure 1 comes from the compositional change between regular and non-regular workers, Figure 2 divides the fluctuation in nominal wages (in terms of total annual earnings per employee) into (1) the nominal annual earnings of regular (full-time) workers , (2) that of non-regular (part-time) workers, and (3) the ratio of non-regular workers using the *Monthly Labour Survey* (the Ministry of Health, Labour and Welfare). Figure 2 implies that the increase in the ratio of non-regular workers to total workers has contributed to a downward adjustment in nominal wages throughout the lost two decades. However, the figure also suggests that this downward adjustment occurred not only because of the increase in non-regular workers but also because of the decrease in the nominal wages of regular workers from 1998. In other words, the downward nominal wage rigidity of regular workers disappeared in Japan after the late 1990s.

Kuroda and Yamamoto's (2005) in-depth investigation confirms that the downward nominal wage flexibility of regular workers began in 1998. Specifically, using the *Basic Survey on Wage Structure* (the Ministry of Health, Labour and Welfare) disaggregated by prefecture, sex, firm size, and age group, we calculate the year-on-year change in total annual earnings per regular worker. Figure 3 shows the change in nominal wages from Kuroda and Yamamoto (2005).[6] The small triangle on the horizontal axis indicates the change in median nominal wages.

Figure 3 shows that the downward nominal wage rigidity constraint was not binding until 1991, because changes in nominal wages were high on average and only a small proportion of the left tails of the distribution were negative. In 1994–95, when the left tails of the distributions became negative, the distributions seem to be skewed to the right because of the relatively large number of samples with a change of near zero and the small number of samples with a negative change, implying downward nominal wage rigidity. From 1998, however, downward rigidity seemed to disappear because a large number of samples were negative and the distributions were not skewed to the right.

Because the observation period adopted in Kuroda and Yamamoto (2005) ends in 2001, we carry out an extended investigation by using data derived from the *Keio Household Panel Survey* (KHPS), which is the broadest longitudinal survey of households in Japan.[7] From the KHPS, we extract data on regular workers less than 60 years of age who worked for the same private firm for two consecutive years. Figures 4(1) and (2) show the year-on-year change in the annual earnings of those individuals by dividing the data into two periods, namely, 2004–2007 and 2008–2011. Regardless of the period surveyed, the histograms show that wage cuts in nominal terms were typical in Japan during this decade.[8]

Using the same KHPS datasets, Figure 5 shows the proportion of workers who experienced wage cuts and the degree of downward wage rigidity by year. Following the approach proposed by Dickens *et al*. (2007), the degree of downward wage rigidity n is calculated as follows:

$$n = f_n / (f_n + c_n), \tag{1}$$

where f_n is the proportion of workers that experienced nominal wage freezes and c_n the proportion that experienced nominal wage cuts. Assuming that the former group would have had a nominal wage cut in the absence of downward nominal wage rigidity, we regard this index as characterizing the degree of downward wage rigidity. Figure 5 shows that even during the economic recovery (2004–2007), almost 40 percent of workers experienced a wage cut every year. The ratio of workers that suffered wage cuts surged to 50 percent in 2009 when the financial crisis hit the economy,[9] confirming that wage cuts in nominal terms became a general trend in Japan during the 2000s.

Nevertheless, the degree of downward rigidity is approximately 15 to 20 percent, which is low from an international perspective. For example, Dickens *et al*. (2007) compare 25 countries (mostly European nations as well as the US) and report an average degree of downward wage rigidity of 28 percent.[10] Similarly, many more recent studies report a strong nominal wage rigidity in the US and Europe even after the global financial crisis in 2008. For example, Fabiani *et al*. (2010) state that the incidence of wage cuts in the Euro area has increased little even after the global crisis, whereas wage freezes have become significantly more common. According to their survey, only 1.8 percent of employees on average have experienced wage cuts after the crisis compared with 32 percent for wage freezes (note that the proportions of wage cuts and wage freezes were 1 and 5 percent during 2003–2007, respectively). Likewise, Daly *et al*. (2012) report that the proportion of US workers experiencing a wage freeze at the end of 2011 was higher than at any other point in the past 30 years. According to these results, Japan can be categorized as a flexible country in terms of nominal wages.

To assess whether such flexibility bear by a particular group of workers or whether wage cuts are broadly carried out across the country, we further investigate wage cuts were more likely to occur on particular type of worker using KHPS datasets. We limit our sample here to regular full-time workers who were employed in the same firm for at least two consecutive years.

Table 1 shows a transition matrix of the following three categories of wage changes from period t to period $t+1$: more than a 1 percent decrease, a change between -1 and 1 percent, and more than a 1 percent increase. The table shows that workers who experienced more than 1

percent wage cuts in period *t* display the lowest probability (27.9 percent) of experiencing wage cuts in the next period. By contrast, half of workers who experienced a wage increase in period *t* display a wage decrease in the next period. These observations show that consecutive wage cuts or rises are less likely to occur. Thus, wage cuts were not limited to particular workers but shared broadly across society.

In the next step, we examine whether a particular group of workers is more likely to experience wage cuts. We estimate random effect probit models with individual characteristics as covariates, where the model takes a value of 1 if the worker experienced a more than 1 percent wage cut and 0 otherwise. The estimation results are summarized in Table 2. The table shows that the older male workers tend to experience wage cuts, whereas managers and clerical workers do not. Those that work in the manufacturing sector also have a higher probability of wage cuts. However, comparing the estimation results by period (2004–2007 and 2008–2011) shows that wage cuts in the manufacturing sector are evident only in the latter period, namely that including the 2008 global financial crisis.

In summary, downward nominal wage rigidity was present until 1998 when it disappeared at both the macro and the micro level because of wage cuts for regular workers as well as an increase in the proportion of non-regular workers to total workers. Moreover, wage cuts have become common phenomenon in Japan during the 2000s. Almost 40 percent of regular workers experienced wage cuts every year throughout this decade. In the next section, we investigate to what extent such downward nominal wage rigidity until the late 1990s or flexibility since then has affected the unemployment rate in Japan.

III. Wage Fluctuations and the Unemployment Rate

One of the major reasons for central banks to target non-zero (but low) inflation rates is the existence of downward nominal wage rigidity. For example, Akerlof *et al*. (1996) use a model simulation to show that in a close-to-zero inflation environment, the unemployment rate would surge since workers resist accepting wage cuts, which leads to higher real wages. Therefore, given the presence of downward nominal wage rigidity, targeting a zero inflation rate would cause inefficient resource allocation in the labor market.

In a similar context, Fortin (1996) points out that a low inflation rate would grease the wheels the labor market by allowing real wages to fall. The Bank of Japan (2006) claims that low-level inflation is necessary to avoid the risk of declining prices: “If nominal wages are downwardly rigid, price declines will cause real wages to rise, thereby reducing demand for labor and raising unemployment. The increase in unemployment is likely to result in deteriorating economic activity caused by declines in income and the subsequent reduction in

spending, thereby triggering a further decline in prices." The bank also states, however, that the size of the safety margin that serves as a buffer against the risk of declining prices depends on several factors, including the degree of the downward rigidity of nominal wages. The bank continues that "if labor markets function flexibly and nominal wages are set flexibly, real wages are adjusted smoothly, regardless of the level of inflation rate, [… which] makes the safety margin less important."

As demonstrated in Section II, nominal wage cuts were typical in Japan after the late 1990s. If nominal wages are set flexibly, did labor market function well after the late 1990s? We plot the Phillips curve of Japan since the late 1980s in Figure 6 to examine the extent to which downward wage flexibility has contributed to avoiding an increase in the unemployment rate. Based on the bursting of the economic bubble from 1993 to 1997, the figure illustrates that the unemployment rate rose from 2.5 percent in 1992 to 3.4 percent in 1997. However, even after 1998, when downward nominal wage rigidity disappeared in Japan, unemployment continued to rise, peaking at 5.4 percent in 2002. These observations imply that the labor market in Japan did not function well despite increased wage flexibility.

The impact of changes in nominal wages on unemployment is investigated by Kuroda and Yamamoto (2005), who report that approximately 1.1 percentage points of the upward impact on the unemployment rate came from downward nominal wage rigidity until 1997. Since the unemployment rate was 3.4 percent in 1997, this finding implies that approximately one-third of unemployment was caused by downward nominal wage rigidity. The paper also estimates that the unemployment rate was pushed down by approximately 0.7 percentage points when nominal wages became flexible in 1998. Moreover, given that the unemployment rate continued to rise even after 1998, the employment adjustment due to downward rigidity may have occurred with a lag. In Japan, labor hoarding is common because of the large cost of employment adjustments. Therefore, it could take several years for firms to make the necessary adjustments to respond to downward nominal wage rigidity. The paper also suggests that the rise in the unemployment rate after 1998 may have resulted from an increase in the mismatches or labor market distortions caused by structural changes to the Japanese economy.

During the economic recovery from 2003 to 2008, nominal wages continued to be negative or nearly zero and the unemployment rate declined sharply from 5.3 percent to 4.0 percent. When the global financial crisis occurred in 2008, nominal wages fell sharply and the unemployment rate rose to 5.1 percent within a year.[11] However, two years later in 2011, this rate had fallen slightly to 4.6 percent. Nevertheless, despite the sharp increase in unemployment immediately after the crisis, the unemployment rate may have been even higher had downward flexibility in nominal wages been absent.

Figure 7 shows average unemployment in 17 countries of the Euro area as well as the rates for the US and Japan. The US witnessed a sharp increase in the unemployment rate from

5.8 percent in 2008 to 9.3 percent in 2009, which has remained persistently high since (8.1 percent in 2012). During the same period, the average unemployment rate in the sampled Euro area countries grew sharply from 7.6 percent in 2008 to 9.6 percent in 2009 and 11.4 percent in 2012. By contrast, the unemployment rate in Japan is relatively low, perhaps because of the downward flexibility in nominal wages.

IV. Is Downward Wage Flexibility the Primary Factor of Japan's Prolonged Deflation?

1. Movements in Nominal Wages and Prices

During the prolonged depression in Japan, some authors pointed out that downward wage flexibility is making it difficult for the Japanese economy to stop the cycle of deflation. This phenomenon is widely known as the *fallacy of composition* (see Yoshikawa 2013*)* because wage cuts trap companies in a negative spiral. Although such cuts make it possible for firms to lower their prices of goods and services while protecting employment at the micro level, each firm's competitiveness does not improve, because they adopt the same strategy. This situation induces firms to reduce their wages and prices further, resulting in a deflationary trap at the macro level. Similar arguments are also found in the US. For example, Krugman (2012) evaluates the US situation as "wage stickiness is if anything good for us right now, helping stave off destructive deflation." Similarly, De Grauwe (2009) states that "today it is becoming increasingly clear that flexibility may not be a quality at all, but a serious handicap" and points out that rigidities in wages, prices, and employment contracts can serve as circuit breakers to slow the debt deflation dynamics.

Given the steady mark-up relationship between wages and prices, Yoshikawa (2013) asserts that downward wage adjustments from the late 1990s have been the key reason for Japan falling into a prolonged deflationary cycle. Figure 8 shows the fluctuations in prices (CPI) and nominal wages (average compensation per employee) since 1995. This figure points out that nominal wages and prices follow a similar trend at the macro level, suggesting that nominal wage cuts are the reason for the deflation in Japan.

At the sector level, however, we see different picture. Figure 9 shows the prices–wages relation for four industrial sectors: manufacturing, retail and wholesale, services, and the public sector. For the manufacturing sector, nominal wages per employee suffered consecutive increases from 1995 (except in 2009),[12] while the average price of durable goods declined dramatically for these 15 years. For retail and wholesale, nominal wages showed a notable decline, while the price of non-durable goods remained stable from 1995 to 2005 and increased thereafter. Nominal wages in the services sector continued to increase until early 2000 before declining at the highest rate among the four studied sectors; however, services prices (excluding

imputed rent) continued to increase until early 2000 and remained stable thereafter. Finally, nominal wages in the public sector showed an upward trend, while price of public sector services also increased somewhat. To summarize, the industry-level relationship between nominal wages and prices shows little evidence that links price deflations to wage deflations.

Since the manufacturing sector is embedded within competitive global markets, particularly in relatively low-wage countries, there may be a strong perception that employee wages have been facing strong downward pressure. However, the above observations illustrate that nominal wages in the manufacturing sector have actually increased, whereas the services sector has experienced more significant wage decreases during the past two decades. These results are consistent with the findings reported by Kodama *et al*. (2012), who use Japanese establishment-level data drawn from the *Basic Survey on Wage Structure*. They examine the wage changes of regular employees throughout the 1990s and 2000s and find that wages in the services sector have consistently declined since 1993, while those in the manufacturing sector have been stable, and sometimes even increasing, in the same period. Moreover, they report that the rate of the decline in wages in the services sector has accelerated over time from 3.0 percent between 1993 and 1998 to 7.8 percent between 1998 and 2003 and to 7.9 percent between 2005 and 2009.

As Kodama *et al*. (2012) point out, the wage decline in the services sector is associated with the increase in non-regular and/or part-time employees. Figure 10 divides the average change in nominal wages in services industries into the wage changes for full-time and part-time employees and the part-time employee ratio. The figure shows that both the decline in full-time employees' wages and the increase in the part-time employee ratio contributed to the overall decline in nominal wages. However, much of that wage decline can be explained by the increase in the part-time employee ratio (except in 2009).

To summarize, nominal wages and prices did not necessarily move in the same direction from the 1990s to the 2000s when examining sector-level data. Rather, at least for these four sectors, nominal wages and prices actually seemed to move in opposite directions during this period.

2. Mark-ups, unit labor costs, and price movements

Nominal wages are just one of many factors that determine prices. Therefore, in this subsection, we investigate how unit labor costs have evolved in the four investigated sectors. Following Yoshikawa (2013), we express unit costs (in the short-run) as follows:

$$UC = (WL + eP_R^* R) / Y = (W / l) + (eP_R^* / r), \qquad (2)$$

where W is nominal wages per worker, L the number of workers, e the exchange rate (yen per

one dollar), P_R^* the international price of raw materials (dollar value), and R the input of raw materials. A small l expresses Y/L, labor productivity per worker, while a small r is Y/R, productivity per unit of raw materials. Thus, the above equation illustrates that unit costs are determined by (a) nominal wages, (b) labor productivity, (c) the exchange rate, (d) the international price of raw materials, and (e) productivity per unit of raw materials.

Under stable mark-up rules, where price is set by a unit cost multiplied by a mark-up rate, price inflation can be expressed as follows:

$$\Delta P / P = \alpha (G_w - G_l) + (1 - \alpha) (e^* + p_r^* - G_r), \quad (3)$$

where G_w is the nominal wage growth per worker, G_l labor productivity growth, and $(G_w - G_l)$ the change in unit labor costs. e^* is the change in the exchange rate, p_r^* the change in the international price of raw materials, G_r the productivity growth of a unit of raw materials, and α the labor share of total production cost. This equation implies that the larger the share of labor costs (as in the services sector), the greater is the influence of the change in unit labor costs ($G_w - G_l$) in determining price movements.

Figures 11(1) to (4) show the fluctuations in prices and unit labor costs for the four sectors. For the manufacturing sector, both prices and unit labor costs decreased during this period, although the decline in unit labor costs was much larger than that of prices. For retail and wholesale, the movements in prices and unit labor costs seemed to be synchronized. By contrast, for services and the public sector, only unit labor costs decreased during this period.

Figures 12(1) to (4) further divide the change in unit labor costs ($G_w - G_l$) into nominal wage growth (G_w) and labor productivity growth (G_l). Labor productivity growth is shown with a negative sign, which means that higher labor productivity growth places downward pressure on unit labor costs. For the manufacturing sector, we see that large labor productivity growth drove down unit labor costs, whereas changes in nominal wages did not contribute in this regard. This finding means that the decline in the prices of durable goods that contributed to mild deflation at the macro level was brought about not by a decline in nominal wages but by the reduction in the number of workers in the manufacturing sector. By contrast, for retail and wholesale and for services, negative wage changes as well as labor productivity growth seemed to contribute to the decline in unit labor costs. For the public sector, labor productivity growth was the main contributor of the decline in unit labor costs both in the 1990s and in the 2000s.

It is important to note that the mark-up ratio was instable and that the labor share to profit ratio decreased during this period.[13] Kawamoto and Shinozaki (2008) and Abe and Noda (2010) both explore why the labor share declined at this time, especially during the economic recovery from 2002 to 2008. Using different firm level datasets, they both conclude that the increase in the governance of shareholders is one factor that drives down the labor share.

Kawamoto and Shinozaki (2009) also state that an increase in uncertainty leads firms to accumulate internal reserves, while IMF (2007) indicates a clear decline in the labor share since the early 1980s across advanced economies and shows that technological change explains most of the decline in labor share in Japan.

We summarize the above observations as follows. First, movements in nominal wages and prices seem to be synchronized at the macro level; however, this homogeneous movement in nominal wages and prices disappears at the sector level. For the manufacturing sector, prices declined consistently throughout the study period, whereas nominal wages per worker increased. By contrast, for the non-manufacturing sector, prices did not decline, while nominal wages per worker dropped substantially. Further, by exploring unit labor costs, we found that the most substantial fall occurred in the manufacturing sector, mainly due to the large growth in labor productivity. For the non-manufacturing sector, unit labor costs also declined owing to both wage decreases (mostly coming from the increase in part-time workers) and labor productivity growth. However, for this sector, prices remained stable or even increased during this period. From these facts, we can conclude that wage deflation does not seem to be a primary factor in Japan's prolonged deflation.

V. Conclusion

Using both macro- and micro-level data, this paper investigated how wages and prices evolved during Japan's lost two decades and made the following three main findings. First, from both macro- and micro-level observations, downward nominal wage rigidity was found to be present until 1998 after which it disappeared. Following wage cuts in nominal terms as well as the increase in the ratio of non-regular workers to total workers, average wages have become downwardly flexible since the late 1990s, with wage cuts commonplace in Japan during the 2000s.

Second, Japan's unemployment rate has been steadily low relative to the rates of other countries, perhaps because of downward flexibility in nominal wages. Third, although movements in nominal wages and prices seem to be synchronized at the macro level, such synchronicity is not observed at the industry level. For the manufacturing sector, prices declined consistently throughout the study period, whereas nominal wages per worker increased. In this sector, unit labor costs have declined substantially mainly because of the increase in labor productivity and decrease in the number of workers. By contrast, for the non-manufacturing sector, prices have not dropped but nominal wages have declined substantially, mostly due to the increase in the ratio of part-time workers. The foregoing evidence thus allows us to conclude

that wage deflation does not seem to be a primary factor in Japan's prolonged deflation, suggesting that wage flexibility is not becoming a serious handicap for Japan.[14]

Figure legends

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Table 1 Transition of wage changes

		Wage change from t to t+1		
		Decrease (less than -1%)	Freeze (-1% to 1%)	Increase (more than +1%)
Wage change from t-1 to t	Decrease (less than -1%)	27.9%	19.3%	52.8%
	Freeze (-1% to 1%)	38.4%	25.0%	36.6%
	Increase (more than +1%)	49.7%	18.6%	31.7%

Data: KHPS (Keio University)

Table 2 Determinants of wage cuts: Estimates of the random effect probit model

	All years		2004-2007		2008-2011	
Age dummies (base=20s)						
30s	0.048**	(0.022)	0.058**	(0.028)	0.044	(0.036)
40s	0.084***	(0.022)	0.070**	(0.029)	0.103***	(0.036)
50s	0.135***	(0.024)	0.121***	(0.032)	0.155***	(0.039)
Tenure	0.001	(0.001)	0.002**	(0.001)	-0.001	(0.001)
Male dummy	0.027*	(0.014)	0.001	(0.020)	0.050**	(0.020)
University graduate dummy	-0.008	(0.011)	-0.014	(0.016)	-0.002	(0.016)
Industry dummies (base=services)						
Manufacturing	0.033**	(0.014)	0.012	(0.020)	0.053**	(0.021)
Wholesale and retail	0.029	(0.022)	-0.006	(0.030)	0.056*	(0.031)
Restaurants and accomodations	0.041	(0.047)	0.057	(0.065)	0.013	(0.067)
Finance and insurance	-0.010	(0.025)	0.005	(0.033)	-0.029	(0.037)
Transportation and IT	0.003	(0.017)	-0.008	(0.024)	0.015	(0.025)
Public sector	0.010	(0.019)	0.017	(0.025)	-0.001	(0.027)
Occupation dummies (base=laborer)						
Service worker	-0.034	(0.026)	-0.008	(0.038)	-0.057	(0.037)
Manager	-0.087***	(0.018)	-0.112***	(0.024)	-0.064**	(0.027)
Specialized or technical worker	-0.024	(0.015)	-0.026	(0.021)	-0.022	(0.021)
Clerical worker	-0.028*	(0.016)	-0.044**	(0.021)	-0.012	(0.023)
Salesperson	-0.019	(0.022)	-0.025	(0.031)	-0.007	(0.032)
Firm size dummies (base=less than 30 employees)						
30-99 employees	0.010	(0.016)	0.008	(0.021)	0.012	(0.024)
100-499 employees	0.008	(0.015)	0.016	(0.021)	-0.002	(0.022)
more than 500 employees	-0.013	(0.015)	0.007	(0.021)	-0.033	(0.021)
Year dummies						
2006	0.008	(0.020)	0.004	(0.020)		
2007	-0.022	(0.020)	-0.026	(0.020)		
2008	-0.019	(0.019)	-0.022	(0.019)		
2009	0.024	(0.020)				
2010	0.103***	(0.021)			0.080***	(0.020)
2011	0.001	(0.020)			-0.023	(0.020)
2012	0.009	(0.021)			-0.013	(0.020)
Observations	9,785		4,941		4,844	
Number of workers	2,444		2,148		1,678	

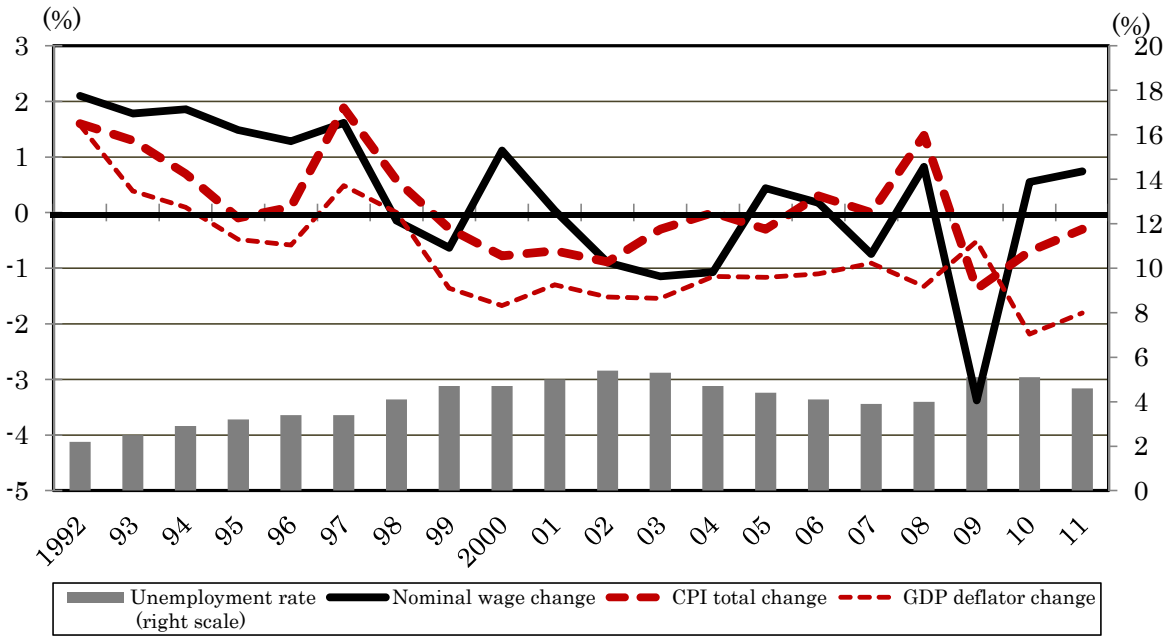
Data: *KHPS* (Keio University)

Notes: 1. Marginal effects are reported.

2. Numbers in parentheses are standard errors.

3.*, **, and *** indicate 10, 5, and 1 percent statistical significance, respectively.

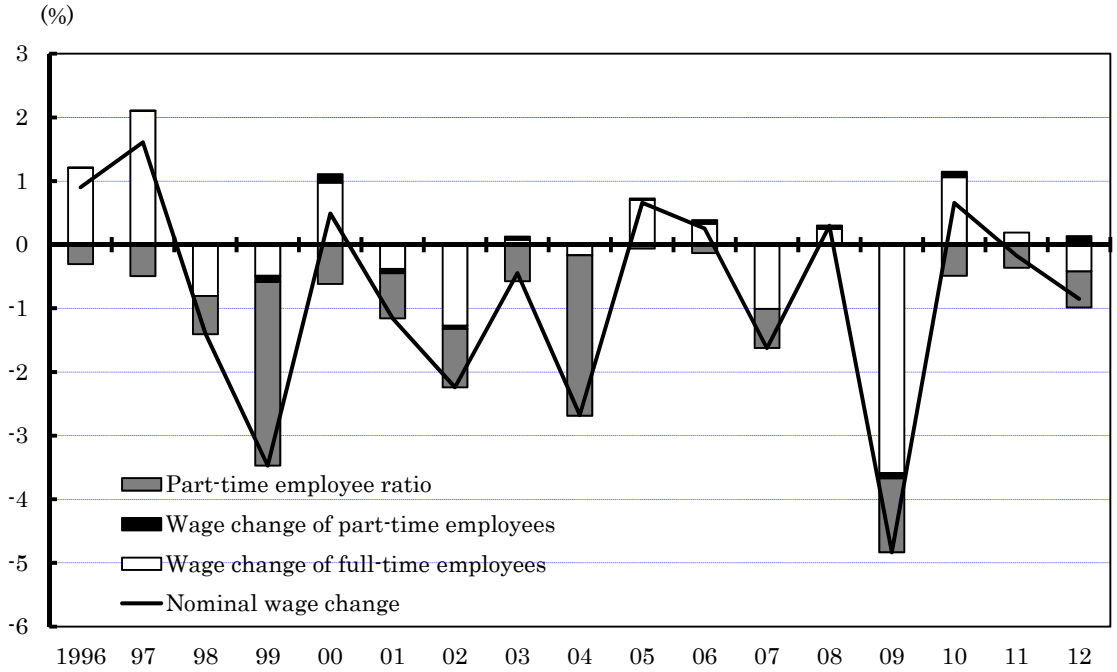
Figure 1



Sources: *SNA* (National Accounts of Japan, Cabinet Office), *Consumer Price Index* (Statistics Bureau), *and Labor Force Survey* (Statistics Bureau)

Note: Nominal wages represents average compensation per employee.

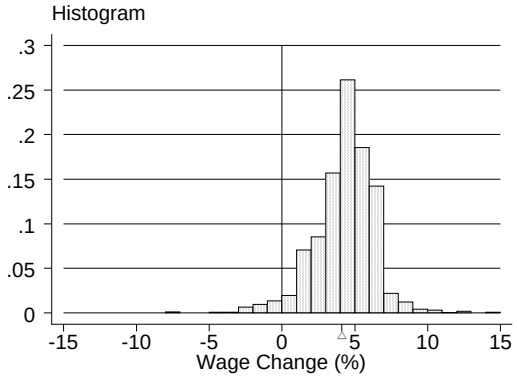
Figure 2



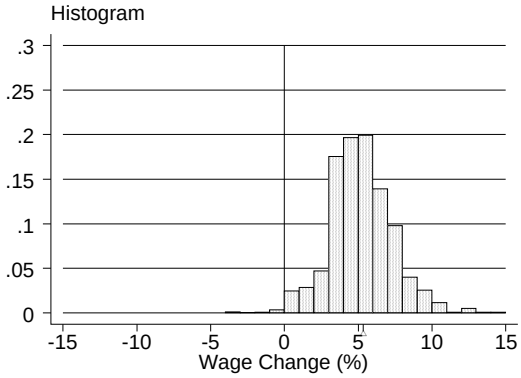
Source: *Monthly Labour Survey* (Ministry of Health, Labour and Welfare)

Figure 3

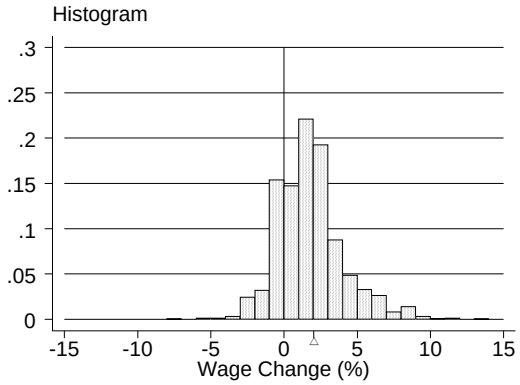
(1) 1988–89



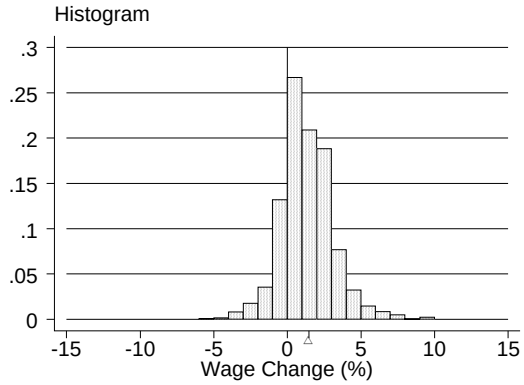
(2) 1990–91



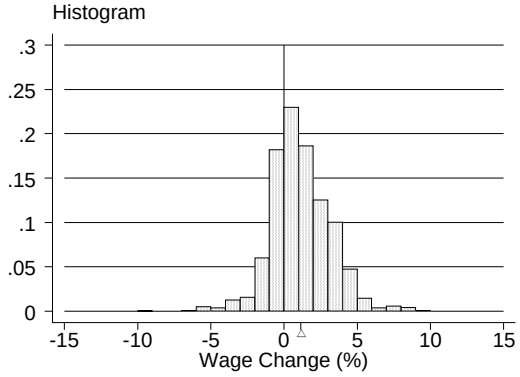
(3) 1992–93



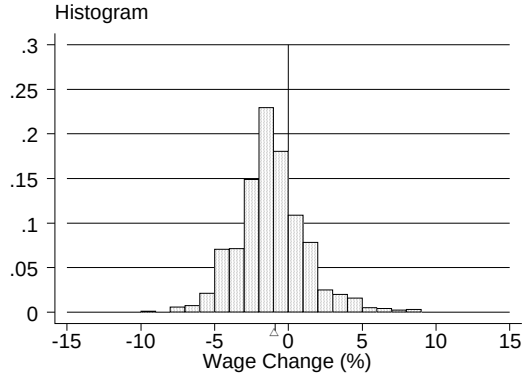
(4) 1994–95



(5) 1996–97



(6) 1998–99

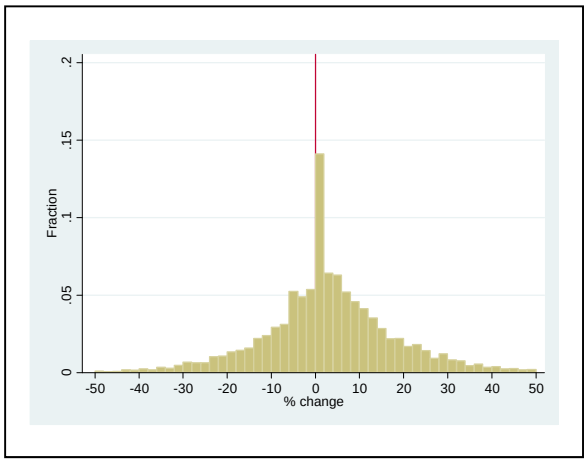


Source: Kuroda and Yamamoto (2005)

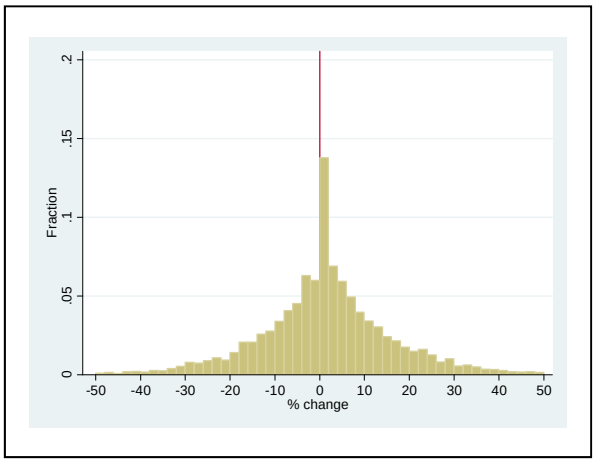
Note: The small triangle (Δ) on the horizontal axis indicates the median.

Figure 4

(1) 2004–2007

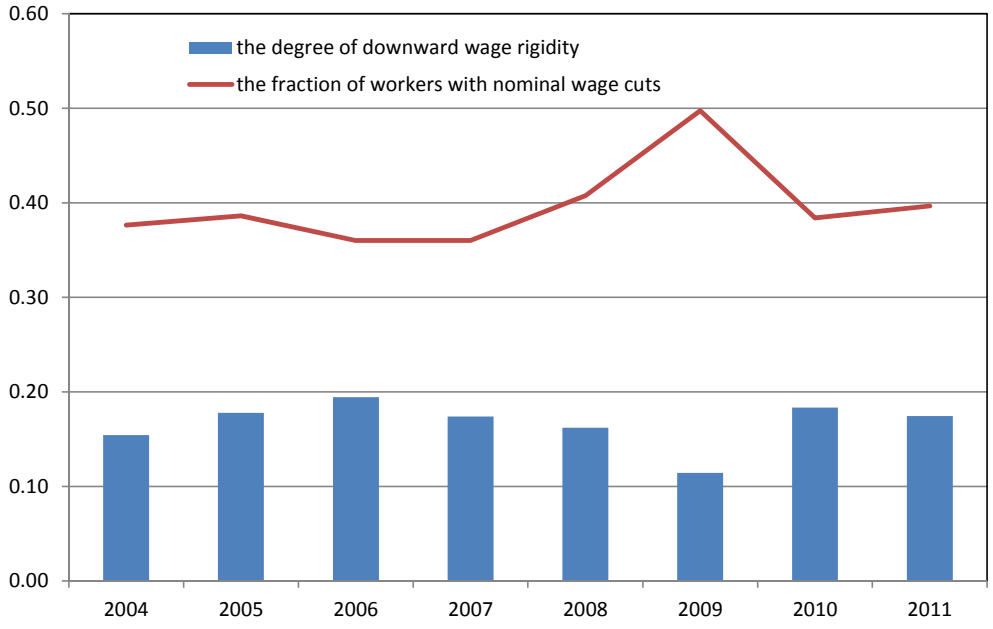


(2) 2008–2011



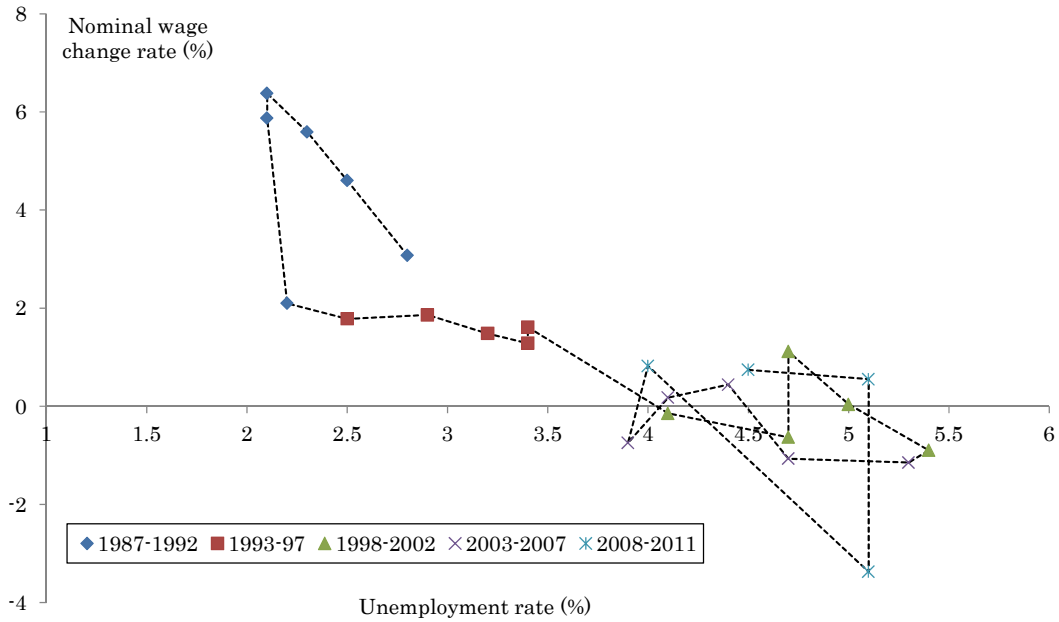
Source: *KHPS* (Keio University)

Figure 5



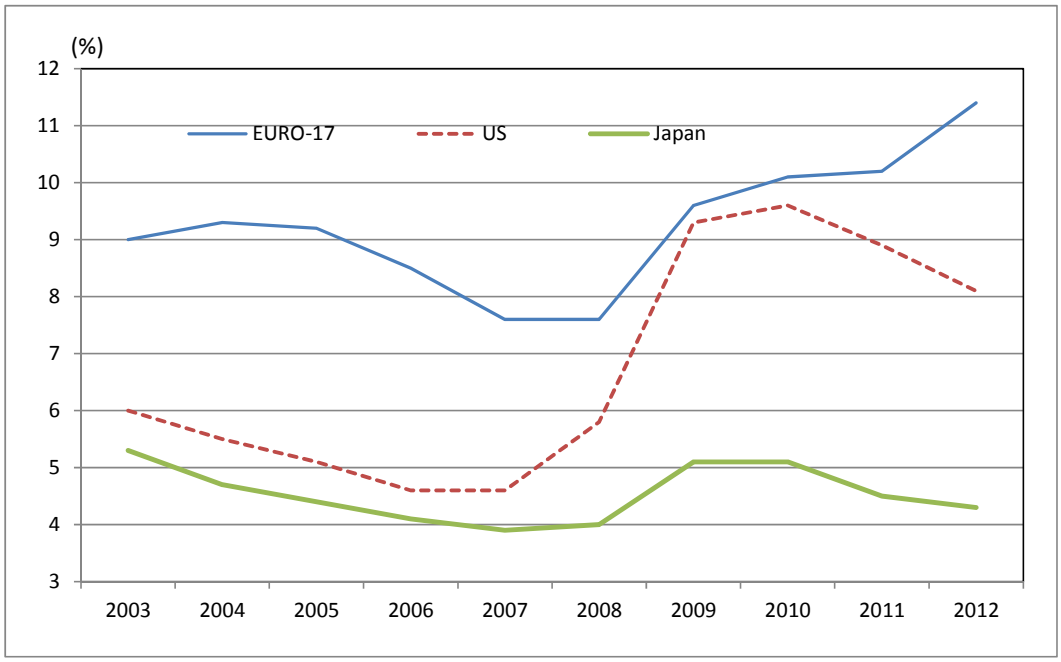
Source: *KHPS* (Keio University)

Figure 6



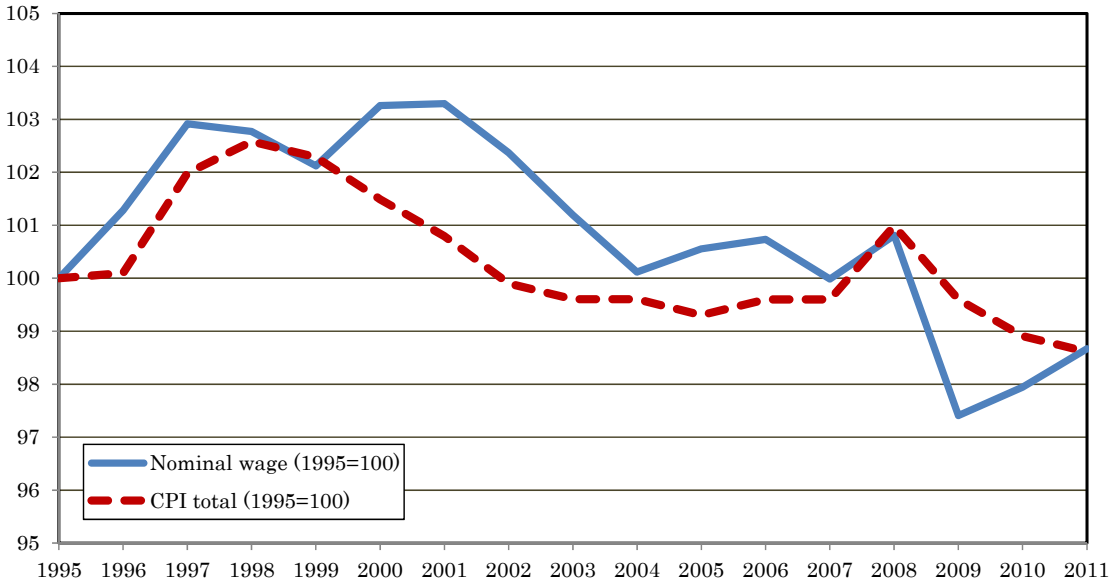
Sources: *SNA* (National Accounts of Japan, Cabinet Office) *and Labor Force Survey* (Statistics Bureau)

Figure 7



Sources: *Labour Force Survey* (Euro-area: Eurostat), *Current Population Survey* (US: Bureau of Labor Statistics), *Labour Force Survey* (Japan: Statistics Bureau)

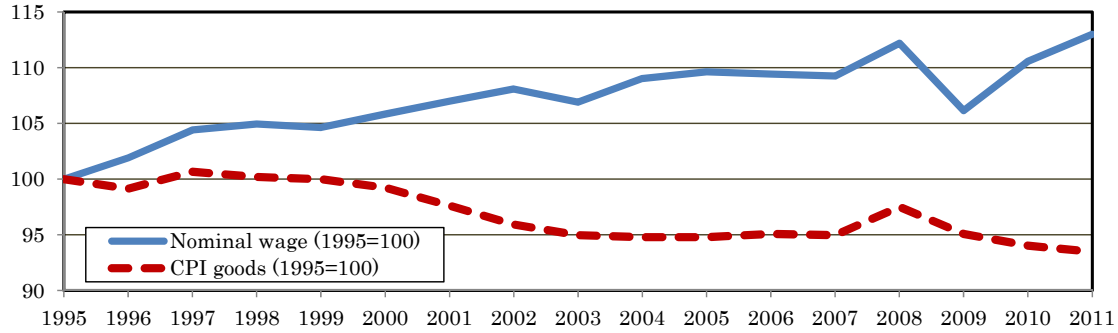
Figure 8



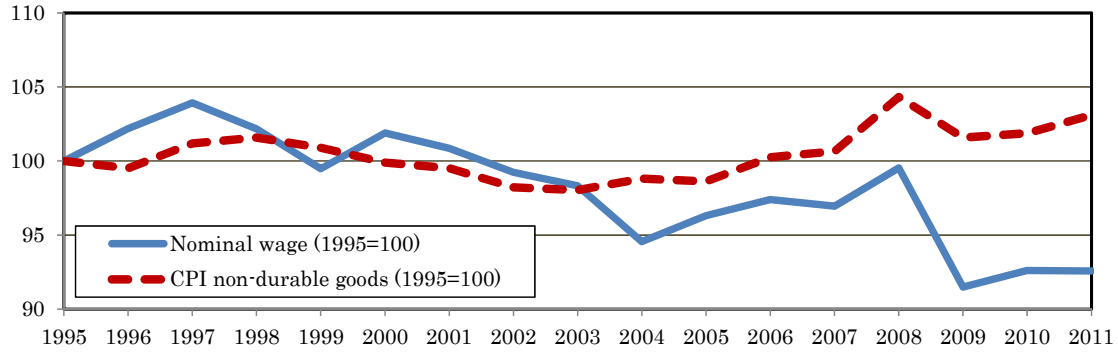
Sources: *SNA* (National Accounts of Japan, Cabinet Office), *Consumer Price Index* (Statistics Bureau), *and Labor Force Survey* (Statistics Bureau)

Figure 9

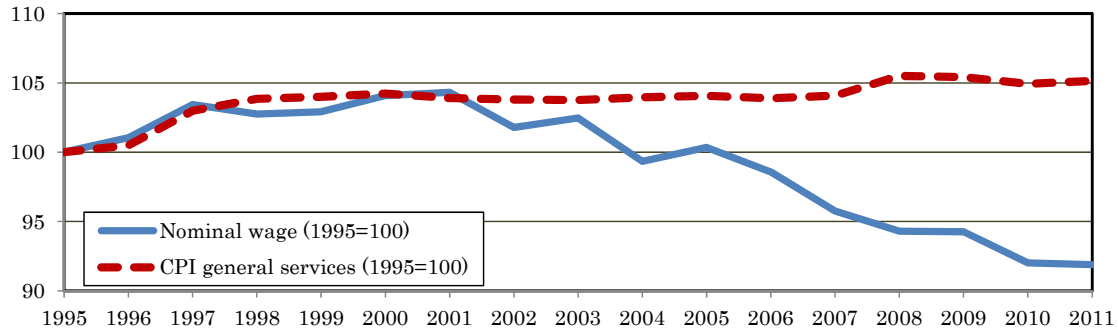
(1) Manufacturing



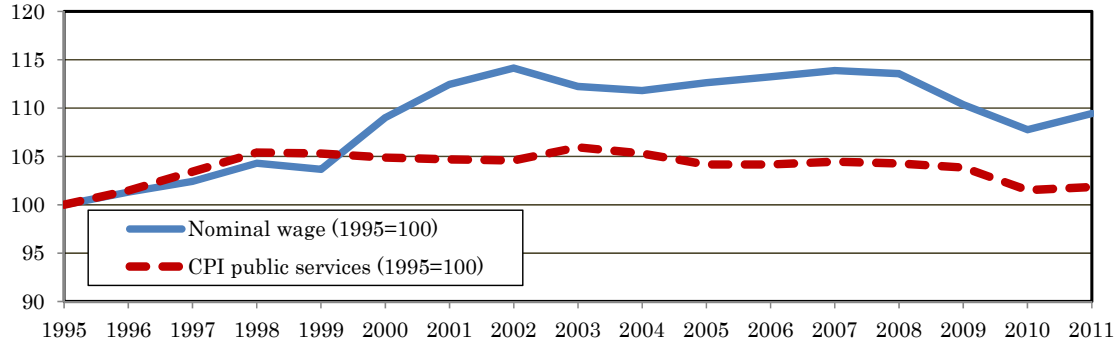
(2) Retail and wholesale



(3) Services sector

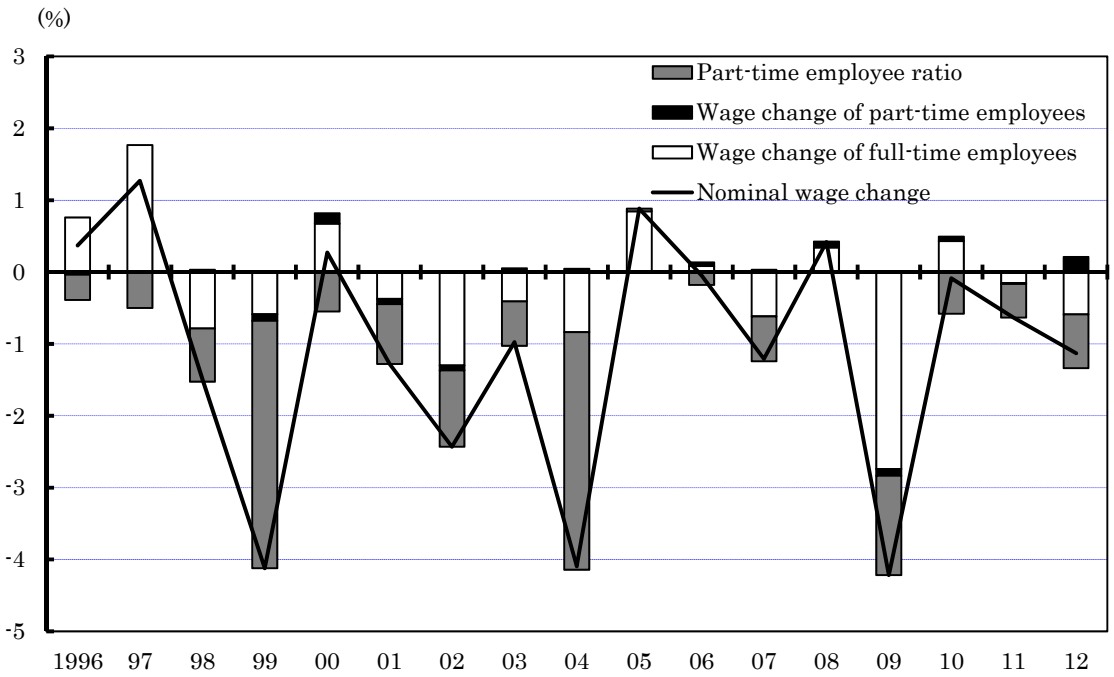


(4) Public sector



Sources: *SNA* (National Accounts of Japan, Cabinet Office), *Consumer Price Index* (Statistics Bureau), *and Labor Force Survey* (Statistics Bureau)

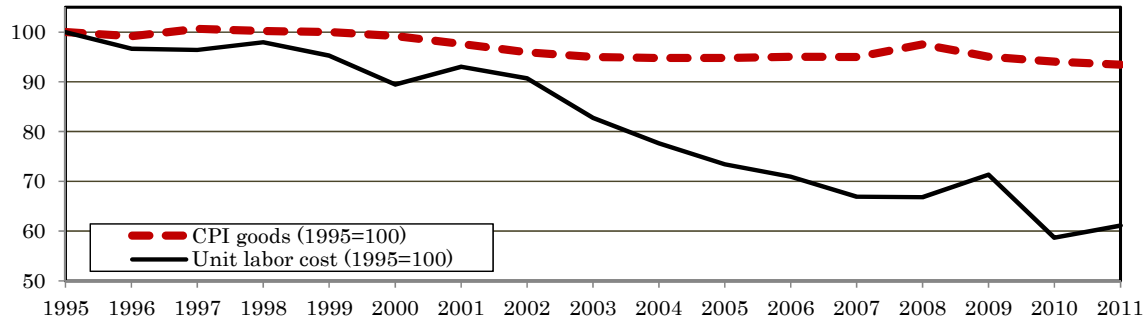
Figure 10



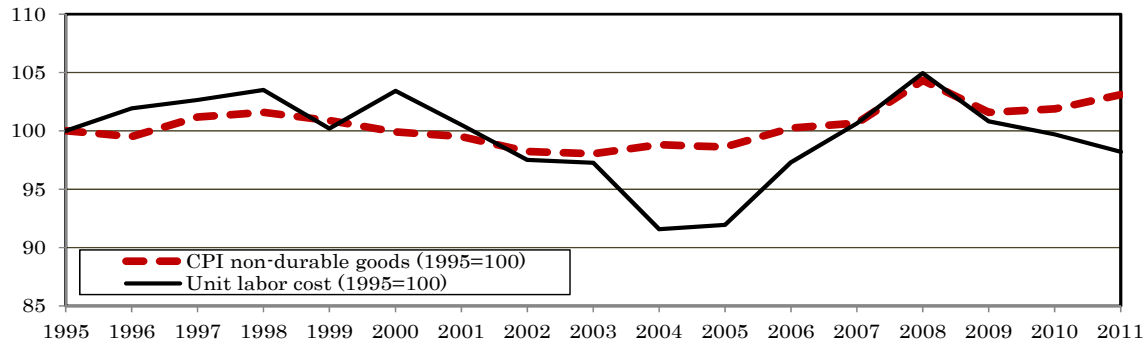
Source: *Monthly Labour Survey* (Ministry of Health, Labour and Welfare)

Figure 11

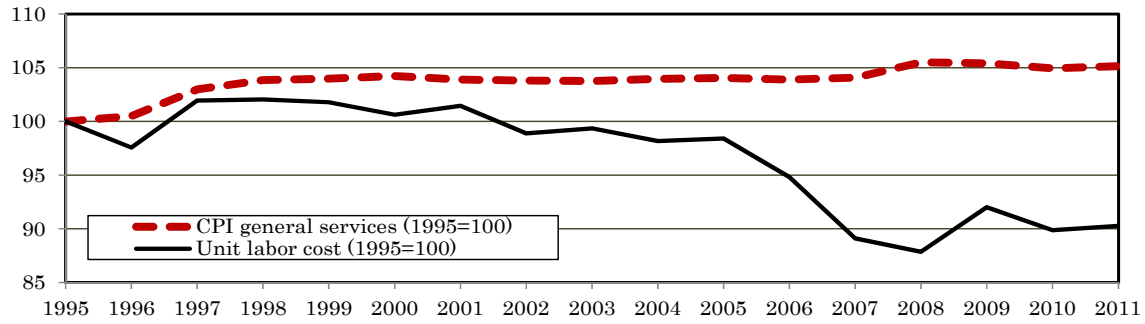
(1) Manufacturing



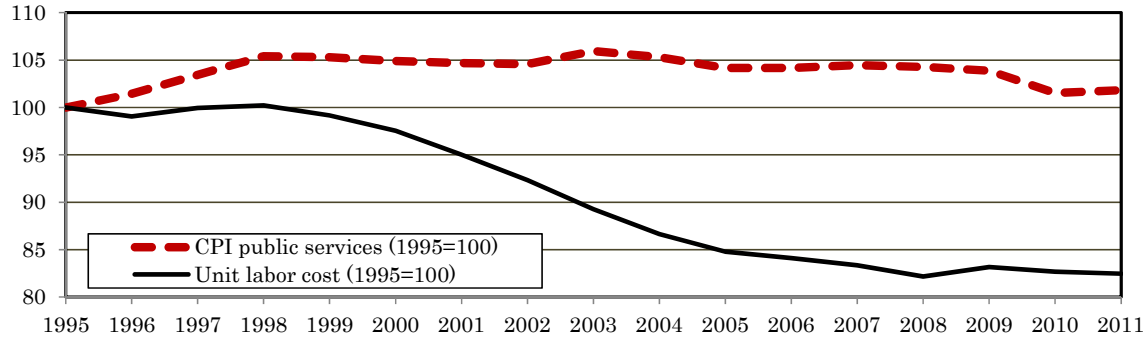
(2) Retail and wholesale



(3) Services sector



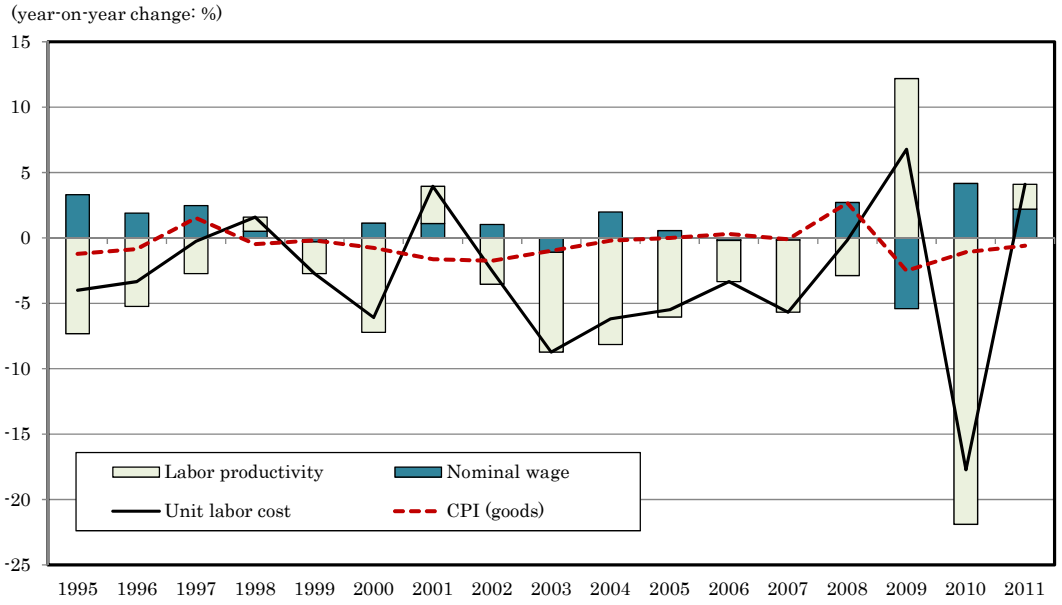
(4) Public sector



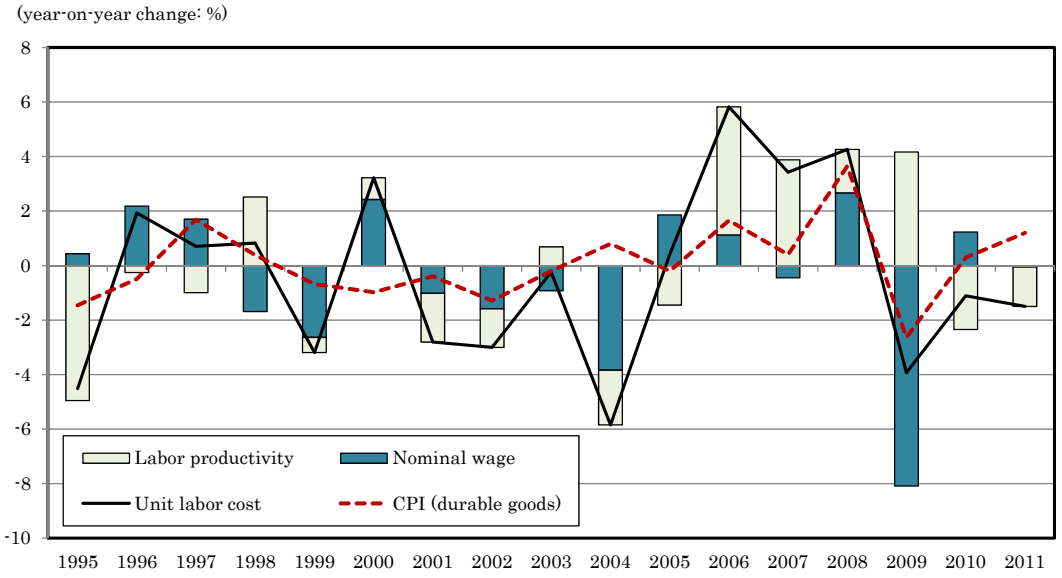
Sources: *SNA* (National Accounts of Japan, Cabinet Office), *Consumer Price Index* (Statistics Bureau), *and Labour Force Survey* (Statistics Bureau)

Figure 12

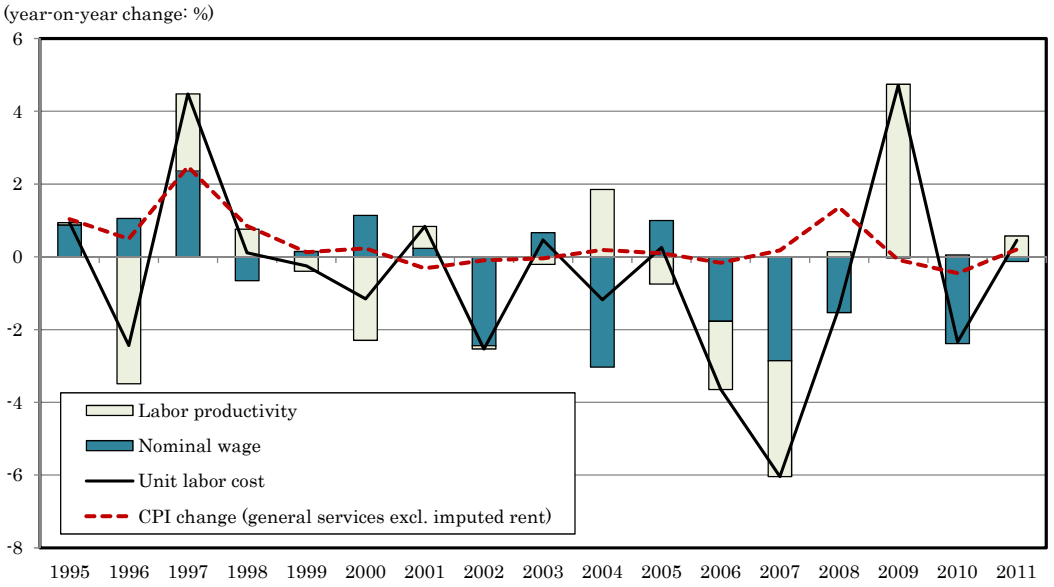
(1) Manufacturing



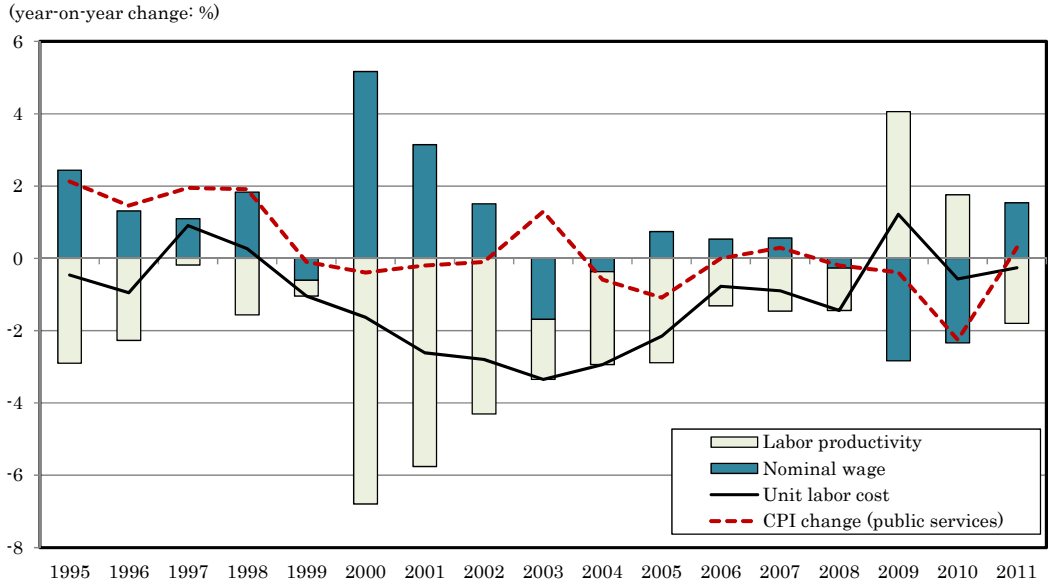
(2) Retail and wholesale



(3) Services sector



(4) Public sector



Sources: *SNA* (National Accounts of Japan, Cabinet Office), *Consumer Price Index* (Statistics Bureau), *and Labor Force Survey* (Statistics Bureau)

Note on endnotes

[1] Using the original survey, Kawaguchi and Ohtake (2007) also find a negative relationship between nominal wage cuts and employee morale in Japan.

[2] Note that some studies yield different findings. For example, studies using company wage records typically show almost no wage cuts, while those using individual wages find many nominal wage cuts. One of the possible reasons of this difference is measurement error (see, for example, Smith 2000). Gottschalk (2005) shows that the probability of nominal wage cuts is substantially overstated in data that are not corrected for measurement errors.

[3] Whether deflation seriously damages an economy is an open question. For example, Atkeson and Kehoe (2004) state that with the exception of the 1930s and Japan in the 1990s and 2000s, "in the rest of the data for 17 countries and more than 100 years, there is virtually no evidence of a link between deflation and depression."

[4] For example, the Japan Institute for Labor Policy and Training (2011) reports that the highest percentage of business establishments set a pay scale of non-regular employees at "80% of regular employees' wage" for both part-time and fixed-term workers.

[5] An important feature of Japan's employment system has been the two-tier structure of a typical firm. In order to protect regular employees from recessions, Japanese firms hire fixed-term contract or part-time workers as a buffer for contingencies. Therefore, a typical practice in Japanese firms is to reduce the amount of non-regular workers during a recession by not renewing contracts, while hoarding regular workers as much as possible.

[6] In calculating the year-on-year change in total annual earnings, Kuroda and Yamamoto (2005) control for changes in employee composition by age group (18–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, and 60–64). Specifically, the paper calculates the year-on-year change in total annual earnings for each age group and then takes a weighted average based on the number of employees in each age group of the previous year. Such a calculation aims to overcome any bias caused by changes in the age structure of employees in a firm.

[7] The KHPS, sponsored by the Japanese government, is a longitudinal survey of individuals that has been conducted by Keio University every January since 2004. It has broader coverage than any other survey in Japan. The survey randomly selects 4,000 individuals from the entire Japan-resident population (men and women) in the age range of 20 to 69 years using two-stage sampling. According to Kimura (2005), no significant differences are found in the distribution of major variables compiled from the KHPS survey questions compared with other official statistics in Japan.

[8] Similar results are also reported in Yamamoto (2007) and Kambayashi (2011).–

[9] Since the KHPS is conducted every January, data for 2010 were surveyed 15 months after the financial crisis in September 2008.

[10] According to Dickens *et al*. (2007), the degree of downward wage rigidity ranges from 4 percent in Ireland to 58 percent in Portugal. Since the results shown in Figure 5 are based on annual income, we have also calculated an hourly wage base rigidity in accord with Dickens *et al*. (2007). The degree of downward rigidity in terms of hourly wage in Japan is 6.4 percent, which is the second lowest among countries. Some studies suggest such differences among countries come from institutional factors. For example, Babecký *et al*. (2009) find that downward nominal wage rigidity is stronger in countries that have stricter employment protection regulations among 15 EU countries. The other possible reason is the difference in the timing and frequency of renewal in wage contracts among countries. For example, Barattieri *et al*. (2010) find that the frequency of both hourly wage and earnings changes is low, suggesting very sticky wages. On the contrary, for countries where contract renewal comes every year at the same time, such as *Shunto* (Spring Wage Offensive) in Japan, wage stickiness may be lower (see Taylor 1989).

[11] This implies that conventional wisdom about a price or quantity dichotomy no longer holds in this period. Regarding this point, see also Ariga and Kambayashi (2010).

[12] Even after controlling for the compositional change in age structure, we observe a similar picture for nominal wages.

[13] Ariga (2006) finds that procyclical fluctuations in mark-up were partially responsible for the relatively steep Phillips curve until the early 1990s; however, the reduced magnitude of the mark-up fluctuations might have contributed to the flattening of the Phillips curve. Ariga and Kambayashi

(2010) conduct an original survey on 2,645 firms and report that 56 percent of them do not conduct mark-up pricing.

[14] Prime Minister Abe made an unusual request for the leaders of large companies to raise compensation for their employees in order to force Japanese firms to part with their cash piles. Whether such coordination by the government is successful is an open question. For example, Ohanian (2009) explains that during the Great Depression in the US, President Herbert Hoover's policies created and fostered industrial cartels, which kept industrial wages above market-clearing levels. Ohanian (2009) also points out that this policy was an important factor in accounting for the failure of the economy to recover back to trend. By contrast, Eggertsson (2012) suggests that the temporary "emergency" declared by NIRA to suspend antitrust laws and facilitate union militancy in order to increase prices and wages was successful in increasing output under the condition of excessive deflation.